INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
ARLINGTON, VIRGINIA 22202

REPORT
NO. 91-012

November 9, 1990

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION
ASSISTANT SECRETARY OF THE ARMY
(FINANCIAL MANAGEMENT)
DIRECTOR, DEFENSE LOGISTICS AGENCY

SUBJECT: Report on the Survey of the Development of the Ground Based Radar Program (Project No. 0AS-0036)

Introduction

This is our final report on the Survey of the Ground Based Radar Program for your information and use. This report contains no recommendations, but addresses other matters of concern that could affect the development of the Ground Based Radar Program. We made the survey from May through July 1990. The objective of the survey was to determine whether the Ground Based Radar Program was being cost-effectively procured by evaluating management actions to achieve program results, as well as evaluating internal controls related to the survey objectives.

The survey was made in accordance with the Inspector General's critical program management element approach. The Ground Based Radar Project Office, U.S. Army Strategic Defense Command, manages the Ground Based Radar Program. Funding for the Ground Based Radar Program through FY 1990 totaled $240 million. As of July 1990, planned funding for FY's 1991 through 1994 was $595 million, and the estimated total life-cycle cost of the Ground Based Radar Program was $3.9 billion.

Discussion

We found no problems pertaining to the announced survey objectives, including internal controls. However, there were other matters that we believe may affect the performance and production of the Ground Based Radar Program. Integration tests of the Ground Based Radar Program to determine the Program's effectiveness with other Strategic Defense System elements were not planned. In addition, planned Program costs may increase, and Program delays may occur, if the Ground Based Radar Experiment turret assembly is not completed on schedule.

Scope of Survey

We reviewed documents applicable to the Ground Based Radar Experiment and the Tactical Ground Based Radar to evaluate survey objectives. We did not address the survey objectives to evaluate

preparation for entering full-scale development and fabrication readiness because a decision had not been made to deploy the Phase I Strategic Defense System. To evaluate the remaining objectives, we analyzed the Ground Based Radar Experiment and Tactical Ground Based Radar Program documents and contracts. We also held discussions with project office and prime contractor personnel for the Ground Based Radar Experiment and Tactical Ground Based Radar Program. We terminated our audit at the conclusion of the survey because we did not identify any problems that required recommendations.

This economy and efficiency survey was conducted in accordance with auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD, and accordingly included such tests of internal controls as were deemed necessary. We obtained and reviewed data and information from FY 1987 through FY 1990 to support the survey. We reviewed system concepts and requirements; Program plans; acquisition strategies; acquisition plans; reliability, availability, and maintainability analyses; test evaluation management plans; business clearance memorandums; Cost/Schedule Control Reports; Contract Funds Status Reports; contracts; independent Government cost estimates; life-cycle cost estimates; cost/price analyses; and Defense Contract Audit Agency reports. In addition, we interviewed Government and contractor personnel responsible for the execution and oversight of the Ground Based Radar Program. Activities visited or contacted are listed in Enclosure 2.

In accordance with auditing standards issued by the Comptroller General of the United States, we included steps in the survey to address potential illegal acts. Based on our survey work, we found no indication of illegal acts. Enclosure 1 provides a summary of critical program management element objectives where controls were adequate.

Background

The Ground Based Radar Program is one of seven elements in Phase I of the Strategic Defense System. The mission of the Ground Based Radar Program is to acquire, track, and discriminate reentry vehicles from decoys and other penetration aids in a real-time environment; to support interceptors deployed to destroy reentry vehicles in the atmosphere and space; and to perform kill assessments in the midcourse and high endoatmospheric flight paths of reentry vehicles.

The Ground Based Radar Program consists of three projects: the Ground Based Radar Experiment Program, which demonstrates the radar's ability to track and discriminate reentry vehicles in space; the Ground Based Radar Experiment Upgrade, which is used on the Kwajalein Atoll; and the Tactical Ground Based Radar, which supports the Phase I Strategic Defense System.

Prior Audit Coverage

There have been no audits of the Ground Based Radar Program. However, two GAO Strategic Defense System reports identified systemic issues affecting the Ground Based Radar Program. GAO Report No. 86-153 (OSD Case No. 7000), "Strategic Defense Initiative Program, Status of Airborne Adjunct and Terminal Imaging Radar," June 23, 1986, informed Congress that to stay within the reduced budget and to avoid schedule delays, the Terminal Imaging Radar Program, predecessor to the Ground Based Radar Program, had to be restructured, thereby increasing the technical risk of the Program. The audit was made as a result of a congressional request for information, and no recommendations were made in the report.

GAO Report No. 90-61 (OSD Case No. 8424), "Strategic Defense System; Stable Design and Adequate Testing Must Precede Decision to Deploy," July 6, 1990, concluded that funding restrictions in FY 1990 increased technical risks not only to the Ground Based Radar Program, but to the entire Phase I Strategic Defense System Program. GAO recommended that the Secretary of Defense request Congress to reinstate Operational Test and Evaluation funding for an independent Strategic Defense System overall system-level assessment, because "end-to-end" testing of the integrated Strategic Defense System was not planned. The report was issued without management comments.

Other Matters of Concern

During our survey, we noted the following issues that we believe should be brought to management's attention.

Testing. No tests were planned to determine the effectiveness of the Ground Based Radar Program as a component of the Strategic Defense System. As reported in GAO Report No. 90-61, there was no planned "end-to-end" testing of the Phase I Strategic Defense System. Tests had not been established to determine if the Ground Based Radar Program:

- can receive messages on reentry vehicle identification from other Strategic Defense System sensors,

- can support exoatmospheric and endoatmospheric interceptors, and

- can perform kill assessments.

Early planning for integration tests may determine if the Ground Based Radar Program is compatible with all elements of the Phase I Strategic Defense Initiative.

Scheduling. The Ground Based Radar Experiment was on schedule during our survey. However, the project office for the Ground Based Radar Program estimated that Program costs could

increase by $50 million if the development of the turret assembly was delayed after September 1990. The turret assembly for the Ground Based Radar Experiment was identified as a critical work element because the turret assembly required a highly calibrated assembly ring to ensure the radar's precision. Specialized tools had to be designed and fabricated to machine this 52-foot diameter assembly ring. The Raytheon Company, the prime contractor for the Ground Based Radar Experiment, estimated that funding of $8 million was required for the ring assembly to prevent the $50 million cost increase.

We provided a draft of this report to the addressees on September 9, 1990. Because GAO has addressed integration testing of the Strategic Defense System elements and because of possible budget constraints placed on Phase I of the Strategic Defense System, no recommendations were made, no comments were required of management, and none were received. Any comments on this final report should be provided within 60 days of the date of this memorandum.

We appreciate the cooperation and courtesies extended to the staff during the survey. If you have any questions concerning this report, please contact Mr. Gordon P. Nielsen, Program Director, at (703) 614-3994 (AUTOVON 224-3994) or Mr. David Wyte, Project Manager, at (703) 693-0497 (AUTOVON 223-0497). The audit team members are listed in Enclosure 3. Copies of this report are being provided to the activities listed in Enclosure 4.

Edward R. Jones
Deputy Assistant Inspector General
for Auditing

Enclosures

cc:
Secretary of the Army

SUMMARY OF CRITICAL PROGRAM MANAGEMENT ELEMENTS WITH ADEQUATE CONTROLS

During the survey phase of the audit, we determined that additional audit work was not warranted in system requirements; reliability, availability, and maintainability; planning for equipment integration; interface definition; readiness for testing; schedule adequacy; and cost estimating versus budgeting. A discussion of these elements follows.

Program Requirements. Planning for Ground Based Radar Program requirements was adequate. System requirements were defined in a midcourse sensor study and validated by the Strategic Defense Initiative Office. Personnel from Federally Funded Research and Development Facilities, such as the Massachusetts Institute of Technology, the Lincoln Laboratory, and the Los Alamos National Laboratory made the study.

Reliability, Availability, and Maintainability Predictions and Planning. Reliability, availability, and maintainability analyses had been prepared for the Ground Based Radar Experiment and appeared reasonable. Analyses verified by the Army's Strategic Defense Command showed that the design satisfied dependability and availability requirements. Reasonable cost estimates for maintenance of the Ground Based Radar Experiment and the Tactical Ground Based Radar had been developed.

Equipment Integration. Equipment integration for the Ground Based Radar Experiment and Ground Based Radar Experiment Upgrade had been documented and appeared adequate. Field integration for the Tactical Ground Based Radar had not been initiated because the engineering and integration contractor (General Electric Company) had not accomplished system coordination for the Phase I Strategic Defense System.

Interface Definition. Interface definition for the Ground Based Radar Experiment had been determined and appeared adequate. In addition, Raytheon Company conducted quarterly audits of the subcontractor's software development for the Ground Based Radar Experiment, and project office representatives witnessed these audits. No major problems were identified during these audits. Progress reviews with the prime contractor of the Ground Based Radar Experiment had not identified any hardware or software deficiencies critical to development of the radar. Interface definition for the Tactical Ground Based Radar had not been initiated.

Readiness for Testing. Test and evaluation management plans had been prepared and appeared adequate for the Ground Based Radar Experiment and the Ground Based Radar Experiment Upgrade. Three Minuteman I missile payloads will demonstrate the capability of the Ground Based Radar Experiment. However, planned payloads will not stress the capability of the radar.

Plans call for the Tactical Ground Based Radar to rely on models and computer simulations to address operational testing. Tests had not been established to determine the effectiveness of the Ground Based Radar as a component of the Strategic Defense System.

Schedule Adequacy. Schedule planning for the Ground Based Radar Experiment appeared adequate and reasonable. The Ground Based Radar Experiment was on schedule and within cost for critically identified work breakdown elements. Contract Cost/Schedule and Control Systems reports and Contract Funds Status reports were submitted monthly. The project office, the Strategic Defense Command, and the Strategic Defense Command contractor reviewed these reports. Audit trails existed to reconcile the prime contractor's work that was in-process and the incurred cost records with the cost and schedule performance reports. In addition, major risk areas for the Ground Based Radar Experiment had been identified. Various program scenarios had been designed to determine the effect of production and integration delays. Life-cycle cost estimates reflected the status of the Ground Based Radar Experiment. However, delayed development of the turret assembly for the Ground Based Radar Experiment could result in increased program costs if adequate funding is not provided. For the Tactical Ground Based Radar, the only schedules established were time frames shown in the acquisition strategy.

Cost Estimating Versus Budgeting. Cost estimating and program budgeting requirements were well defined and adequately documented. Differences in contract proposal submissions and Strategic Defense Command independent cost estimates for the Ground Based Radar Experiment were insignificant. Work breakdown element estimates for the Ground Based Radar Experiment extended to five levels of cost and could be tracked through the prime contractor's cost accounting system. The prime contractor, as well as the major subcontractor, were submitting required Contract Data Requirement List items. Program restructuring exercises were being completed to determine the cost and scheduling effect of reduced program funding.

ACTIVITIES VISITED OR CONTACTED

Office of the Secretary of Defense

Strategic Defense Initiative Organization, Washington, DC

Department of the Army

U.S. Army Strategic Defense Command, Washington, DC
U.S. Army Strategic Defense Command, Huntsville, AL

Defense Logistics Agency

Defense Plant Representative Office, Waltham, MA

Defense Contract Audit Agency

Defense Contract Audit Agency, Raytheon Company, Equipment Division, Marlborough, MA

Non-Government Activities

Raytheon Company, Equipment Division, Marlborough, MA
Raytheon Company, Equipment Division, Wayland, MA

AUDIT TEAM MEMBERS

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Other Defense Activities

Director, Defense Logistics Agency
Director, Strategic Defense Initiative Organization

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Non-DoD Activities

Office of Management and Budget
U.S. General Accounting Office,
NSIAD Technical Information Center

Congressional Committees

Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
Senate Ranking Minority Member, Committee on Armed Services
House Committee on Appropriations
House Subcommittee on Defense, Committee on Appropriations
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